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ABSTRACT

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Blueprinting Teacher Licensing Tests: Developing Domain Specifications from Job Analysis Results

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ABSTRACT

An increasing number of states are requiring educators to take certification tests in order to obtain a license to teach. While this trend shows little sign of waning, there is little to guide the developer of teacher licensing tests in defining test specifications in a legally and technically sound manner. This paper discusses the legal and technical issues that must be considered in developing specifications for teacher licensing tests. A practical, technically sound, and legally defensible methodology for developing specifications for teacher licensing tests from job analysis results is presented.

Bluprinting Teacher Licensing Tests: Developing Domain Specifications from Job Analysis Results

Over the past two decades an increasing number of states have required educators to pass one or more tests in order to obtain a license to teach. There are currently 30 states that have mandated some form of competency testing for teachers and at least 13 others are seriously considering moving in this direction. While there are numerous tools available to test developers for identifying the domain of knowledge to be included on tests of student competency, there is little to guide the developer in specifying the domain of content to be included in licensing tests for teachers. This paper discusses the use of job analysis results in specifying the domain of content to be included in licensing tests for teachers. The legal and technical issues that must be considered in developing test specifications from job analysis results are addressed and the specific methodology employed for developing specifications in a recent teacher licensing test development effort is described. An overview of job analysis is provided below to provide a context for the discussion of these issues.

Job Analysis

Any instrument designed for certification or licensing, as is the case in teacher certification testing, must be shown to be job related. It must fairly measure the content knowledge relevant to the job as performed by

present job incumbents. Determining the job relatedness of content selected for inclusion in certification tests is both endorsed in the APA Principles for the Validation and Use of Perscnnel Selection Procedures (1980) and required by the Equal Employment Opportunity Commission Guidelines (1978). The guidelines require that the criteria used as a basis of certification must bear an empirical and logical relationship to successful job performance. For purposes of teacher certification, this suggests that test content should reflect the content knowledge or pedagogical skills required for teaching. While there are a number of ways in which this domain of knowledge can be identified, a systematic job analysis is recommended to establish an empirical and logical relationship to teacher performance.

Job Analysis Approaches. Job analysis is a process of systematically collecting information about the elements of a job. While job analysis has been routinely used in personnel-related areas for close to a century, it is only within the past few decades that it has been employed in personnel testing.

A variety of approaches to assessing the elements of a given work situation are available; however, regardless of the selected method, most approaches include some determination of the critical and frequently performed elements of the job. Importance (criticality or essentiality) and frequency of performance (time spent or percentage of time consumed on job) are the two key dimensions underlying most job analysis approaches. Within the teacher certification arena, this would generally take the form of assessing the important and frequently applied teaching skills or content knowledge in the instructional setting.

Job analysis approaches can be seen to vary along a number of dimensions. Levine, Ash, Hall, and Sistrunk (1981) have delineated three key dimensions along which job analyses vary:

- type of descriptor or element used to describe the job,
- the source of job information, and
- data collection methodology.

Among the descriptors used to describe a job are tasks, activities, skills, knowledge, and personal characteristics. A number of sources of job information are potentially available; these include job incumbents, supervisors, trained job analysts, and written documents. Data collection methods include questionnaires, interviews, observation, diaries, and actual job performance. Although it is clear that many approaches to conducting job analyses are available, the application of job analysis methodology to teacher certification testing has been somewhat limited.

Current applications of job analysis methodology to teacher certification testing is presented below. Other job analysis approaches derived from the three dimensions cited previously, with potential applications to teacher certification, are offered following the discussion of current applications.

Job Analysis Applications. Job analysis has been used in the content validation of teacher certification tests in a number of states. Among the states that have conducted job analyses as part of their teacher certification test development efforts are Georgia, Alabama, Oklahoma, South Carolina, and

West Virginia. In all five cases a survey approach was used. A sample of educators within the state were sent a survey instrument requesting them to rate on a Likert-type scale a series of content objectives, developed by panels of content experts, in terms of the amount of time spent teaching or using the objectives and the extent to which the objectives were essential to the field. Based on the job analysis results, those objectives found to be most job related were included in the content of the examinations. In some cases an interview procedure was used with a sample of educators to supplement the quantitative ratings and gather further information about job content.

Similar procedures were used in the development of the Florida Teacher Certification Examination. Teacher competencies (objectives) were developed by a panel of teacher educators. The competencies were then sent to a sample of educators who rated the competencies in terms of their perceived "importance" to the field. No ratings of "frequency of use" or "time spent using" were collected.

Similar procedures have been used for more process-oriented assessment measures developed for use in teacher certification. The Basic Professional Studies Examination developed in Alabama to assess knowledge of pedagogical skills relied on job analysis for determining the content to appear on the test. A sample of educators across teaching fields rated the frequency with which pedagogical skills were used and the importance of those skills. The content of the Performance Observation Instrument developed in South Carolina was defined through a job analysis. Again, using a survey approach, a sample of South Carolina educators rated the importance and frequency of use (as well as observability and relevance) of a series of teaching skills and behaviors.

The recently revised "Common" portion of the NTE did not rely on job analysis data in defining the content to be included on the examination. Here, state representatives were surveyed to determine the extent to which a proposed set of pedagogically related topics are important for purposes of teacher certification.

Job Analysis Alternatives. While job analyses conducted for current teacher certification tests have almost exclusively been limited to survey questionnaires requesting job incumbents to rate proposed test content in terms of importance and frequency of use, other alternatives suitable for use in teacher certification testing are available. Recommendations for job analysis alternatives based on (1) type of data collection methodology and (2) source of job information are provided below.

Teacher certification test development efforts, to date, have relied on the collection of job information from a cross section of job incumbents reflecting the teaching area for which the measure is being developed. Alternatives to the use of a cross section of job incumbents include the collection of job information from supervisors or solely from superior performers on the job. Previous research comparing the job information obtained from job incumbents and other observers is conflicting (Levine et al., 1981). While the information obtained from incumbents and other observers appears to be consistent in some job settings, Levine et al., (1981) suggest that in other settings incumbents tend to provide less accurate

accounts of their job content. No specific attempts have been made to investigate the information obtained from teachers as compared to the information obtained from other observers in the instructional environment, and the accuracy of teacher/educator supplied information remains to be explored.

Similarly, little effort has been made to compare the job information obtained from teachers judged as superior to educators judged to be poor performers. While Levine et al. (1981), in their recent discussion of job analysis methodology, suggest that there are few differences in the job information obtained from superior and less capable performers in a variety of job settings, this remains to be verified in the instructional setting. The validity of teacher certification tests based on job content defined solely by superior performers could be brought into question as these measures are generally designed as minimum competency assessments.

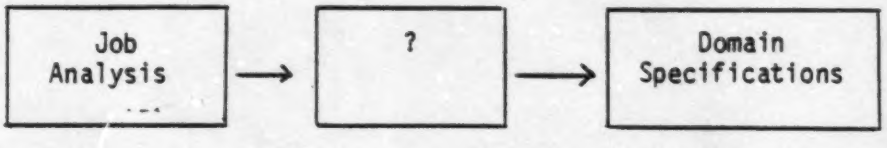
There are a number of alternative data collection methods that could be applied to analysis efforts undertaken for teacher certification test development purposes. Among the alternatives to the survey questionnaire approach (which has been the primary data collection method employed for teacher certification testing to date) are (1) observation, (2) critical incident technique (Flanagan, 1954), (3) document review, and (4) group discussion.

Job analysis data collection using observational methods relies on trained observers observing the performance of job incumbents. Within the realm of teacher certification, this would involve trained observers observing the classroom behavior of teachers or other instructional personnel to ascertain the content of the job. While providing a direct assessment of the job content, the feasibility of this approach is questionable because of its obtrusiveness and resources required. This is particularly true in the case of content knowledge examinations developed for teacher certification purposes; repeated observations over an extended period of time would be required to provide an accurate assessment of the content knowledge required on the job.

The critical incident approach, developed by Flanagan (1954), involves the identification of job events that have resulted in either inferior or superior performance (i.e., events that elicit behaviors necessary for successful job performance). A large number of incidents are collected from job incumbents (through diaries, interviews, etc.) and are used to determine what behaviors are necessary to be effective on the job. In application to teacher certification testing, this would require the elicitation of critical incidents in the instructional setting from a pool of instructional personnel. This approach is potentially useful for the development of teacher performance measures or tests focusing on pedagogical skills; however, the critical incident technique appears to have little application to content knowledge-oriented measures. Levine et al., (1981) report that this approach was not favored by experienced job analysts for use in personnel selection.

The final two data collection approaches with potential application to teacher certification are document review and group discussion. Document review involves the use of available literature defining a job as a basis for determining necessary job content. Here, job descriptions and other documentation would be reviewed to determine the critical aspects of the job to include in a personnel selection instrument. To the extent that such documents exist within educational environments, this approach could be employed. In fact, the review of such documents is already carried out, to a limited extent, in the definition of content knowledge or skills to be included on job analysis survey instruments used in existing teacher certification test development projects. Similarly, the fourth and final method to be considered--group discussion--has been used in the development of existing teacher certification tests. In the development of certification tests for Georgia, South Carolina, Alabama, Oklahoma and West Virginia, panels of experts were convened in the respective content areas to generate content for inclusion on the job analysis survey instrument. This could be expanded to include supervisors and incumbents in the respective areas who would formally rate the knowledges and skills identified in terms of their importance.

While there is little question that teacher licensing tests should be job analysis based, there is little to guide the developer of teacher licensing tests in making the huge leap from job analysis to domain specifications.



This problem was addressed in a recent test development effort designed to produce a licensing test for teachers of Business education. The procedures used in developing domain specifications from the job analysis results are described below.

Domain Specification Procedures

Initial Domain Definition. The first step in specifying the domain of content to be included on the licensing test for Business Education teachers was to delineate the job content was defined as a set of cognitive objectives defining the content required and the (taxonomic) level at which it needs to be known. A comprehensive set of objectives can be derived through a variety of methods including: Review of existing job definitions, certification standards and curriculum materials, expert panels, observation, and interviews.

For the development effort, a comprehensive set of cognitive objectives was defined based on a review of teacher certification standards, curriculum materials and textbooks. The set of approximately 200 objectives were categorized into five major content subareas: Business Communication Skills, Business Math and Accounting, General Business, Business and Youth Organizations and Information Processing. The set of objectives developed was reviewed by a panel of eight

practicing Business Educators and objectives were revised, added, and deleted as necessary to ensure that they reflected the field of Business Education as it is taught and understood in the jurisdiction in which the test was to be used for licensing.

Conduct Job Analysis. Determining the job-relatedness of objectives selected for use in certification testing is a requirement of the Equal Employment Opportunity Guidelines. According to the guidelines, the criteria used as a basis of certification must bear an empirical and logical relationship to the actual job content. The job analysis procedure described below provides this information by identifying the objectives which are most representative of the content knowledge required for teaching Business Education.

At the conclusion of the objective review, the Business Education field had been defined by a set of objectives approved by the panel of experts. These objectives were then submitted to a job analysis to determine their "job-relatedness." A panel of content experts was asked to indicate, for each objective, the amount of time spent teaching or using the objective and the extent to which the objective was essential to the field. Obtaining ratings of "time spent" and "essentiality" from panels of content experts has been used in a number of task and job analyses serving as a basis for the development of certification and licensing tests.

Time spent teaching or using an objective was rated on a five-point scale ranging from "very little time" to "very much time." Essentiality was also rated on a five-point scale ranging from "essential to a very little extent" to "essential to a very great extent."

Analyze Job Analysis Results. The objective ratings were analyzed to determine the extent to which each objective was "job-related." Descriptive statistics were computed for each objective on the two rating scales completed by the panel of Business Education content experts. The average (mean) amount of time spent teaching or using the objective and the average (mean) extent to which educators felt the objective was essential to the field were determined. Finally, the grand mean rating and standard deviation across all objectives rated was determined. Based on the grand mean and grand standard deviation the objectives were divided into four categories for each rating scale:

- Preferred (P). Objectives with job analysis ratings more than one standard deviation above the grand mean objective rating.

- High Acceptable (HA). Objectives with job analysis ratings at the grand mean or within one standard deviation above the grand mean objective rating.

- Low Acceptable (LA). Objectives with job analysis ratings at or within one standard deviation below the grand mean objective rating.

- Least Job Related (LJR). Objectives with job analysis ratings less than one standard deviation below the grand mean objective rating.

The purpose of the Job Analysis was to determine the job-relatedness of each objective. Since time and essentiality were considered to be of equal importance as criteria for job relatedness, the data were plotted on a graph with mean essentiality scores on the abscissa and mean time spent scores on the ordinate. By graphing, a picture of the relative position of each objective along both dimensions can be seen.

Objectives which were rated "Low Acceptable," "High Acceptable," or "Preferred" on both rating scales were considered job-related.

Objective Selection. The EEOC Guidelines (1978) specify that the content of any test used for personnel selection, such as a teacher certification test, must bear an empirical and logical relationship to the actual job content. In order to ensure that the test was directly related to the content of the Business Education field, the number of objectives to be represented on the test for each content subarea was determined to be proportional to the total number of job-related objectives observed in the subarea. Specifically, a proportional number of job-related objectives (P, HA, LA) was selected from each subarea. A total of 50 objectives were selected to be measured by the test. The selection of 50

objectives reflects a balance between ensuring adequate content coverage and ensuring that each objective was measured by more than one test question. The number of objectives selected from each subarea was based on the following formula:

$$\frac{\text{Total Number of P, HA, and LA objectives in subarea}}{\text{Total Number of P, HA, LA objectives in objective list}} = \frac{\text{Number of P, HA, LA objectives to be selected in subarea}}{\text{Number of P, HA, LA objectives to be selected for the test (N=50)}}$$

Based on this formula, the number of objectives selected for each subarea was as follows:

Subarea	Number of Job-Related Objectives	Number of Selected Objectives
I.	25	12
II.	27	12
III.	25	12
IV.	8	4
V.	23	10

Develop Test Blueprint. After the number of objectives to be selected from each subarea had been determined, the specific objectives for which items were written were selected. The objectives selected for the test were chosen primarily based on the job analysis results. In all cases, those objectives that were rated as preferred on both the time spent and essentiality scales were selected for item writing. The remaining objectives were selected from among the most highly rated objectives; those rated as high acceptable on one or both of the two rating scales. Where two objectives were found to measure similar content, only one of the objectives was selected and another job-related objective was selected to increase content coverage.

The selection of all objectives rated as preferred on both scales and the remaining set of objectives from those rated as high acceptable on one or both of the scales ensures that the test reflects the most job-related aspects of the field. To ensure that the number of items assigned to each area maintains the proportions of the job and that each objective is adequately covered, each objective was assigned three items on the test.

In summary, this model determines those aspects of the job content that are job-related, selects a subset of the content that is most job-related to be represented on the test, ensures that the job content selected from each subarea of the job is proportional to the amount of time spent and perceived importance of the subarea on the job, and appropriates test items to maintain these proportions and to ensure adequate coverage of objective content.

The approach described provides specific guidelines to the test developer for developing test specifications from job analysis results. The methodology presented offers a practical approach for developing licensing tests specifications while satisfying legal and technical requirements for licensing test development.

Future Directions

There are a number of aspects of the approach described in this paper that are currently being investigated as part of the NES Research Program

in this area; most importantly, research is being carried out to examine the approach used to determine the weighting of each major content subarea included on the test. These issues are discussed below.

The approach described in this paper uses the number of objectives observed to be job related in each subarea as a basis for determining the amount of weight to be given to that subarea on the final test form. The number of test items (weighting) assigned to each major content subarea is based on the percentage of job related objectives included in that subarea. For example, if a major content subarea contains 20% of the objectives found to be job related based on teacher's ratings, 20% of the test items are assigned to this subarea. While the job analysis results ultimately determine the weighting given to each subarea, the initial "size" of the subarea is based on the number of objectives included in the subarea prior to job analysis. This ensures that the weight assigned to each subarea is based on sound judgments by a panel of content experts; however, it provides limited input into weighting for the sample of incumbents rating the objectives. To ensure greater input for those rating the objectives, one could obtain ratings of the importance of each major content subarea from respondents in addition to the specific objective ratings obtained. Each respondent could be asked to determine the importance of each subarea by assigning 100 points across the subareas. For example, if there were four subareas, one might assign the 100 points as follows: subarea 1: 20 points, subarea 2: 30 points, subarea 3: 45 points, subarea 4: 5 points. The average ratings for each subarea across respondents could be transformed back to a scale ranging from 1-100 and treated as proports that could serve as subarea weights.

Relying solely on survey respondents ratings does have drawbacks however; respondents may not have the broad perspective on the field that is offered by a panel of subject area experts. To ensure that both subject area experts and job incumbent input is adequately represented, consideration could be given to using a composite rating that relys both on rating obtained from survey respondents and from the proportion of job related objectives observed in the subarea. The NES research program in this area is currently exploring approaches to combining these two pieces of information to obtain subarea weights.

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